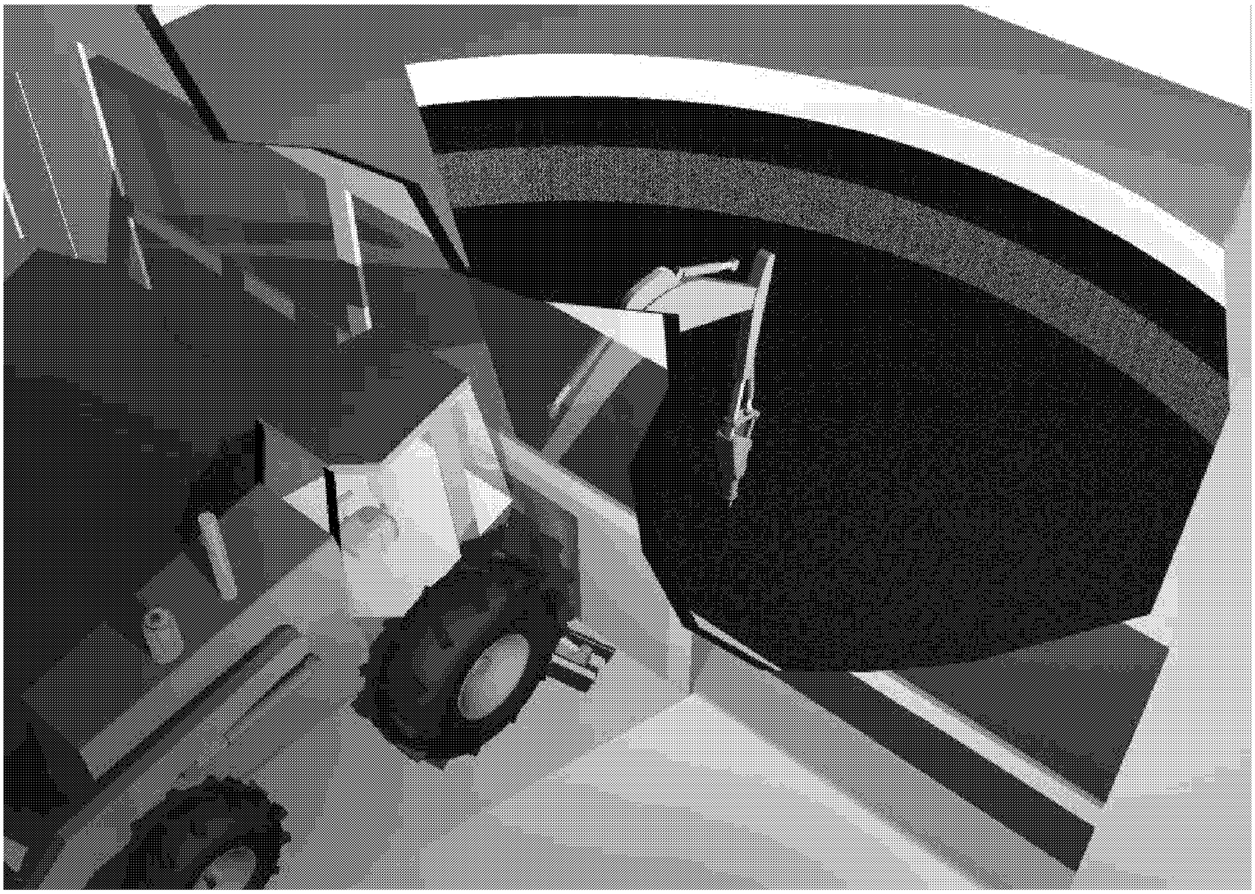

Figure 3-26. A hydraulic hammer is used to drive the sampler into the underburden.

3.5.3 Waste Transfer Equipment

Waste is moved between the excavator and the PGS by the waste transfer equipment, which consists of the waste transfer cart, the cart rails, the rail structural supports, and the cart drive system. The waste transfer cart is a 30 by 40-in. stainless steel weldment that is approximately 6 in. deep. The cart is shown in Figure 3-27. It has a bed that accepts and supports a 55-gal drum, or holds about 3 ft^3 of waste material. The cart may need to be rotated 90 degrees atop its mounting table if the drums are loaded with their major axis perpendicular to the gloveboxes.

The cart's mounting table rides on linear ball bushings and is driven by a ball screw that spans the length of the glovebox. The linear ball bushings are supported by a steel structure that is designed to withstand a 1,000 lb. drum dropped into the cart from a height of 1 ft. Snubbers may be incorporated into the design to allow the structure to adequately dissipate the energy of the drop.

The cart's drive ball screw extends from the end of the cart support structure completely through the glovebox so that the cart can be driven anywhere in the glovebox. Energizing the screw motor drives the cart into and out of the glovebox.

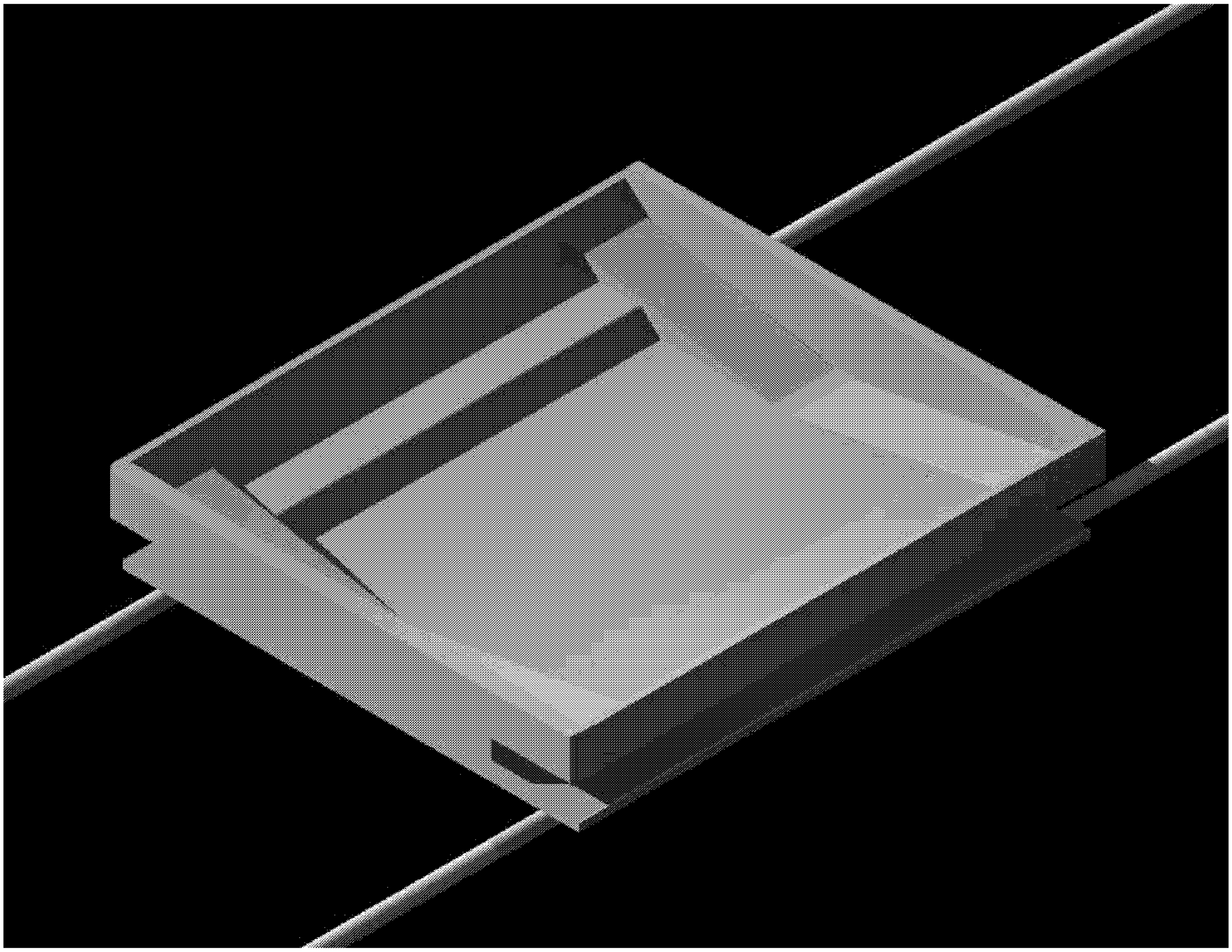

Figure 3-27. Waste transfer cart, on rails, transports waste into the glovebox.

3.5.4 Waste Transfer Equipment Operation

The waste transfer cart is loaded with a waste bag to receive the waste and positioned at the end of the rails inside the RCS. After the excavator places the waste load in the waste bag on the cart, the cart is rotated lengthwise to the PGS if necessary. The cart drive system is then energized and the cart is transported into the glovebox. After the cart is emptied in the PGS, it is returned into the RCS by operating the drive stem screw in the opposite direction.

3.5.5 Packaging Glovebox System

Waste zone material is opened, inspected, sorted, sampled, sized, monitored, and packaged in the PGS. The PGS, shown in Figure 3-28, consists of three identical gloveboxes, which fan out along radial lines from the excavator arm pivot.

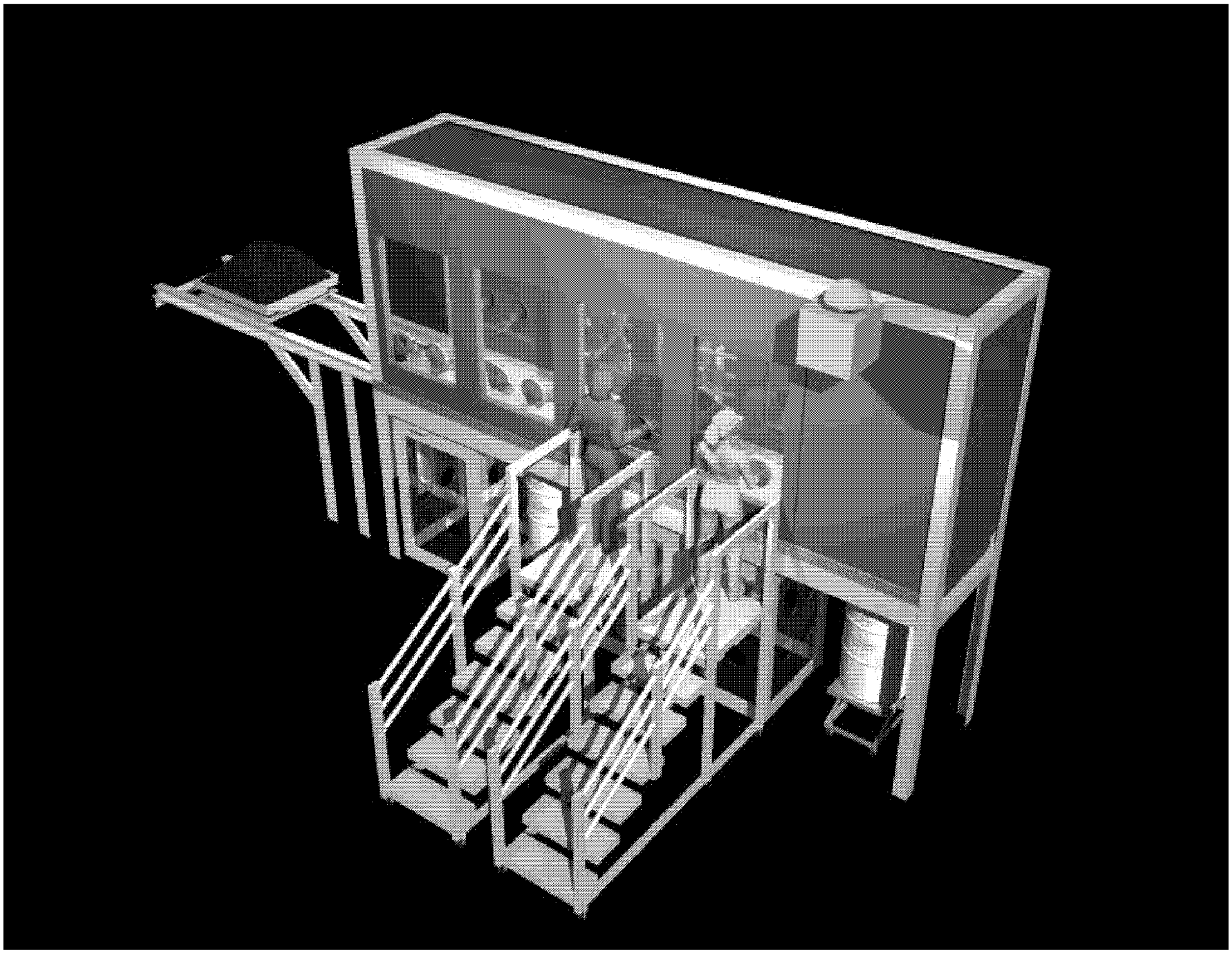

Figure 3-28. The packaging glovebox is a safe method of confinement that provides for waste sorting and sampling.

Glovebox Description. Each glovebox is a rectangular stainless steel box approximately 21 × 3.5 × 7-ft high with Lexan windows and gloveports at each of five stations along both sides of its length. The gloveboxes are sealed for confinement. An external structure of painted carbon steel lifts the bottom of each glovebox approximately 7 ft above the FFS surface. Movable stairs on either side of the glovebox provide operator access to the gloveports. The gloveboxes are opened to, and sealed to, the RCS at their west ends for acceptance of the waste in the waste transfer carts. The normal operating pressure is –0.7 iwg. The boxes are designed for bubble-tight leakage at a vacuum of 4 iwg. This qualifies the glovebox for passive safe shutdown.

As shown in Figure 3-28, each drum is contained in a secondary confinement enclosure. This enclosure provides contamination control throughout the bagout operation. If a bag is ripped or dislodges from the bagout ring, the contamination will be contained inside the enclosure. The bagout operation will be performed through gloveports in the enclosure. The drums will be swiped prior to opening the enclosure.

Glovebox Bagout Stations. The bottom of each glovebox has three drum bagout ports, depicted in Figure 3-29, for passing and packaging waste into new drums. Each port has a lid inside the glovebox as well as a funnel to protect the bags when loading waste into the drums. The clean drums are located below the ports and their bags are sealed to the bottom of the bagout ports to preserve confinement. During waste loading the bag is protected by a funnel inside the glovebox. A standard double bagout method is used at each station. This station design was mocked up for the previous OU 7-10 Stage II, 90% design and worked well. The drums are supported at the bagout stations by hydraulic scissors-jack platforms that raise and lower the drums for proper packaging and bagout operations. Each platform has a rotary table for rotating the drum during the bagout operation. The scissors jacks are recessed into pockets in the FFS. Each station is capable of handling both 55- and 85-gal drums. The scissors jack hydraulic power unit is located under the west end of each glovebox.

Glovebox Sorting Station. The glovebox sorting station is the second glovebox station from the RCS interface. Here operators inspect, sort, sample, size reduce, segregate, and load waste into clean 55-gal drums located at the left and right of this station. These activities normally are done while the waste is on the transfer cart. To reduce the amount of dust in the glovebox, the waste is normally contained in a bag on the cart. The entire bag can be lifted by hand or by a glovebox hoist and packaged into one of the drums at the adjacent bagout stations.

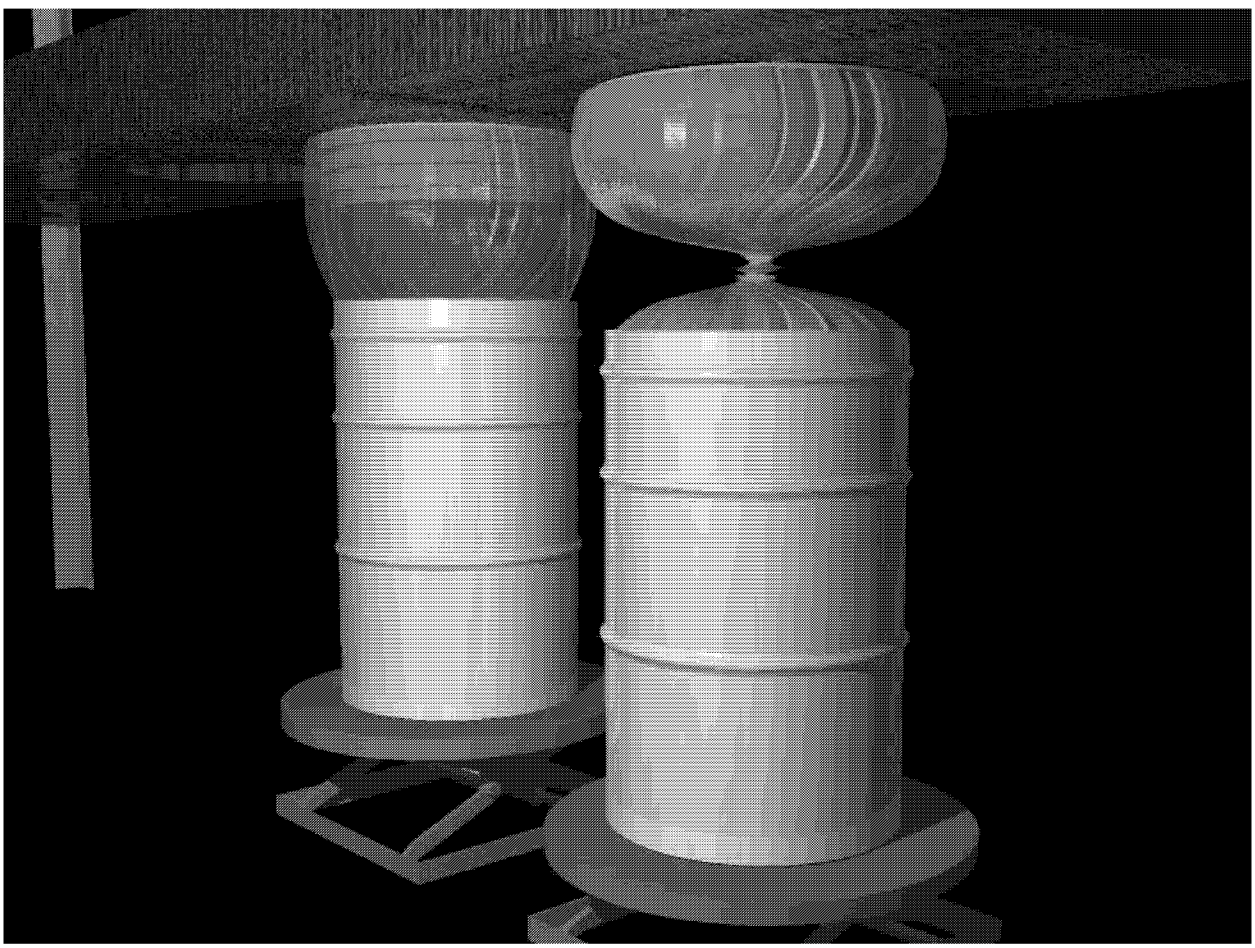

Figure 3-29. The drum bagout ports are a safe method of sealing packaged waste.

If an intact drum is brought into the glovebox, it is opened and its contents placed on a second cart that stays inside the glovebox. The drum contents are dispositioned as above and the drum is either cut up or placed in an 85-gal overpack at the third bagout position. A cemented drum can be placed, intact, into the 85-gal drum located at the third bagout station.

Glovebox Fissile Monitor System. The fifth glovebox station from the RCS interface (i.e., at the east end of the glovebox) has a well, formed in the bottom of the glovebox, for fissile monitoring of any visually unidentifiable combustible material. The fissile material monitor (FMM) is located under the glovebox floor next to the well and is shown in Figure 3-30.

Glovebox Cart. As mentioned above, there is a second cart in each glovebox. These carts are primarily used to receive the contents of intact drums. The drum lid is removed at the glovebox sorting station and the contents transferred to the second cart. That cart can then be used as the sorting cart for loading into the two adjacent bagout drums and to transport visually unidentifiable combustible material to the fissile monitoring well at the end of the glovebox.

Glovebox Hoist. The glovebox contains a 1-ton, electric powered, trolley-mounted hoist that can travel the length of the glovebox. The hoist is used primarily for intact cemented drums and items too heavy to handle through the gloveports.

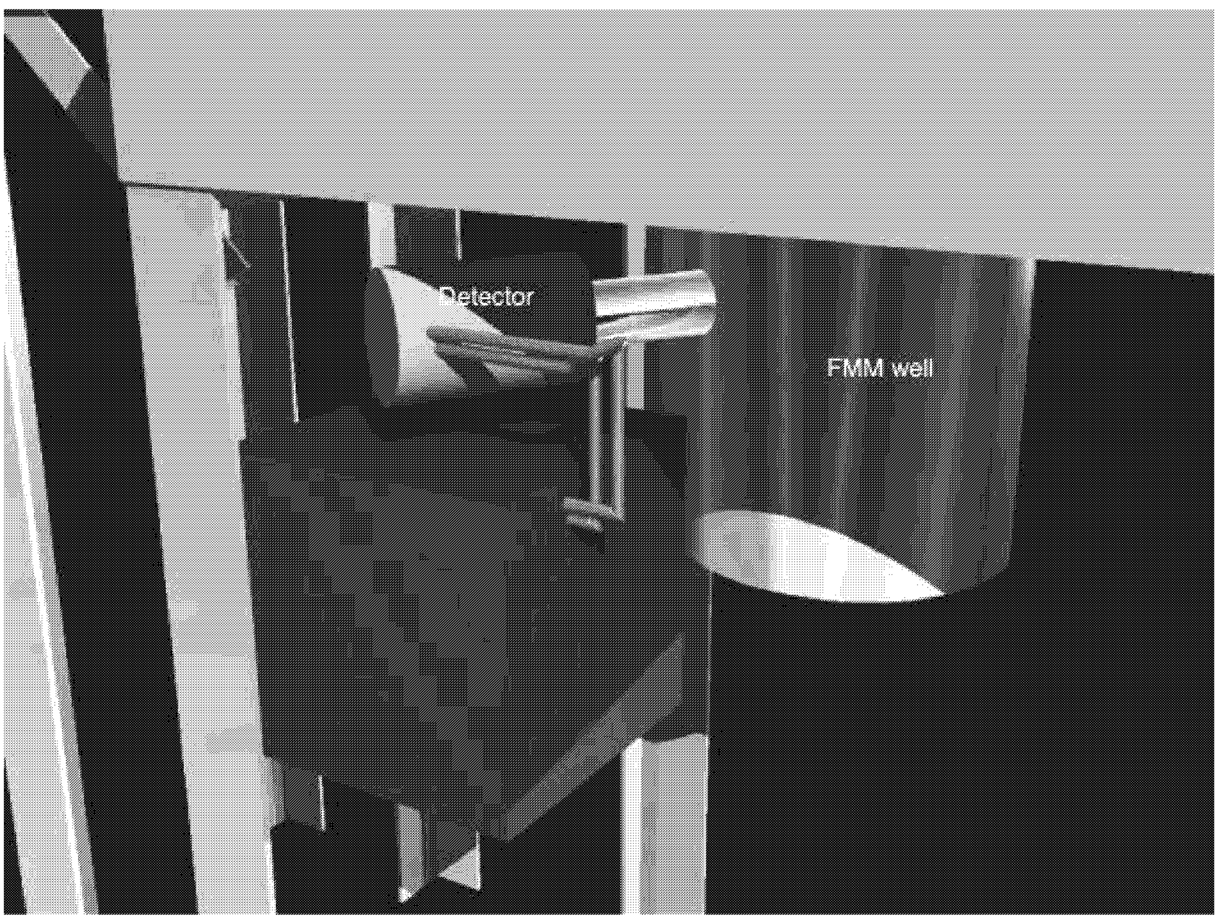

Figure 3-30. The fissile monitoring station scans suspect material prior to packaging to prevent overloading a drum.

Glovebox Tools. The glovebox is equipped with hand-operated sizing tools such as a sawsall and shears. These are used to size items that are too large to fit in a 55- or 85-gal drum.

Glovebox Lighting. The glovebox is equipped with lights that provide 100 foot-candles of light in the operating areas. The lights are positioned to provide indirect lighting for the operators (i.e., no light can be seen directly) and are mounted outside the confinement.

Glovebox Fire Suppression and Detection System. Each glovebox has a local, automatic, water mist fire suppression system. See Section 3.6.4 for a detailed description.

Storage Drum Handling. The drums are loaded and unloaded from the hydraulic scissors-jack platforms at the bagout stations by a manually operated hydraulic forklift.

Glovebox Ventilation System. Each glovebox is ventilated by air that is pulled through an inlet damper and HEPA filter (not testable with dioctyl phthalate [DOP]) located near the east end of the glovebox. This will filter any air that escapes from the glovebox during the unanticipated event of a flow reversal in the glovebox of the RCS. Figure 3-31 shows the inlet ventilation system. The air is pulled through the glovebox and into the RCS through the opening between the glovebox and the RCS wall by the exhaust fan located at the north end of the RCS. There are approximately 12 air changes per hour in the glovebox. This system ensures that dust and contamination is swept out of the glovebox and towards the RCS.

3.5.6 Packaging Glovebox Operation

As mentioned above, waste zone material is brought to the glovebox and opened, inspected, sorted, sampled, sized, monitored, packaged, and bagged out in the packaging gloveboxes. This section covers these operations in more detail.

Waste Receipt. Waste zone material is transferred from the RCS area into the glovebox by the waste transfer cart (see Figure 3-32). The cart is fitted with a flat bag incorporating "D" rings for lifting. The cart, loaded with material in the cart bag, is driven into the glovebox and stopped at the segregation station, between the first and second drum bagout stations. Free, i.e., not packaged, waste is expected to be interstitial soil, free debris, sludges, cemented waste, or a combination of these. Containerized waste is expected to be in plastic bags, partially deteriorated 55-gal drums, or intact 55-gal drums.

Waste Removal from Drums. Waste in intact or partially deteriorated drums must be removed from the drum for inspection, sorting, etc. Figure 3-33 shows waste drum unloading. The drum lid is removed at the first glovebox station, either by removing the nut on the locking hoop or cutting the hoop with the sawsall or other hand-operated equipment. The glovebox cart that resides in the east end of the glovebox is moved next to the drum at the sorting station and the drum's contents are pulled out and placed on the empty cart. If the cart is full before the drum is empty, the drum is driven back into the RCS to wait. The waste on the cart in the glovebox is then segregated, sampled, etc. as described below. Finally, the waste is lifted by a 1-ton hoist in the PGS using the "D" rings on the cart bag and placed into one of the two 55-gal drums at the bagout stations. When the intact drum is empty, it is placed intact in the 85-gal drum at the bagout station or cut up with the sawsall and placed in a 55- or 85-gal drum.

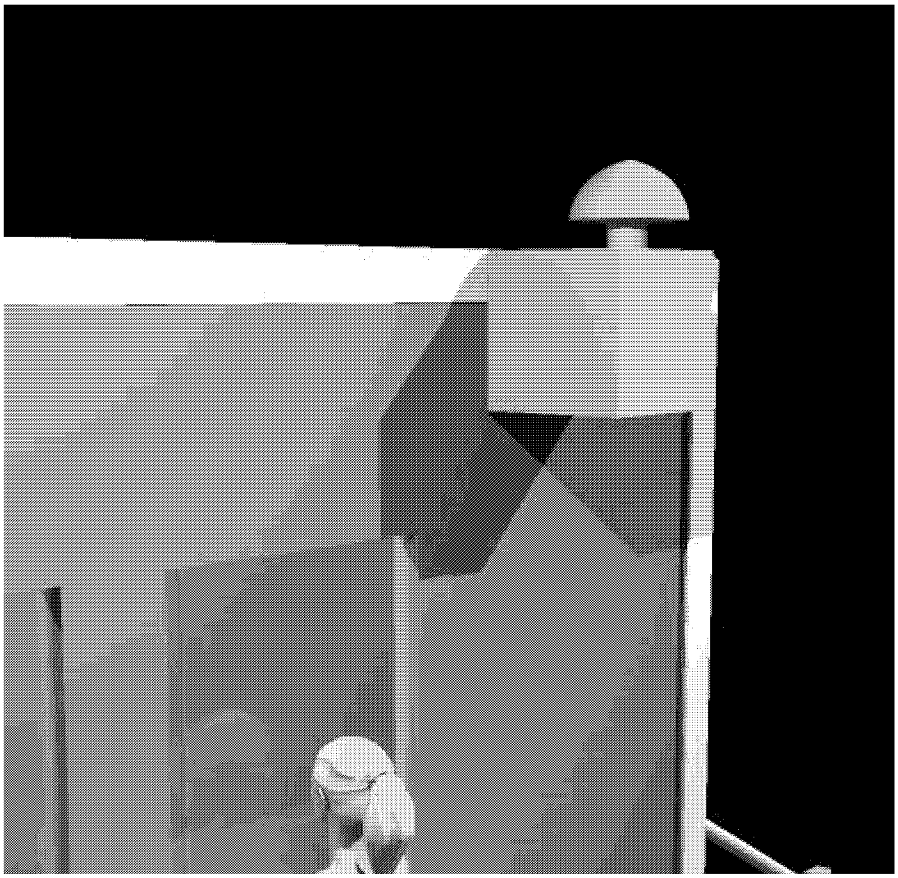

Figure 3-31. The glovebox inlet has a HEPA filter in case of backflow.

Figure 3-32. Waste zone material is received in the glovebox.

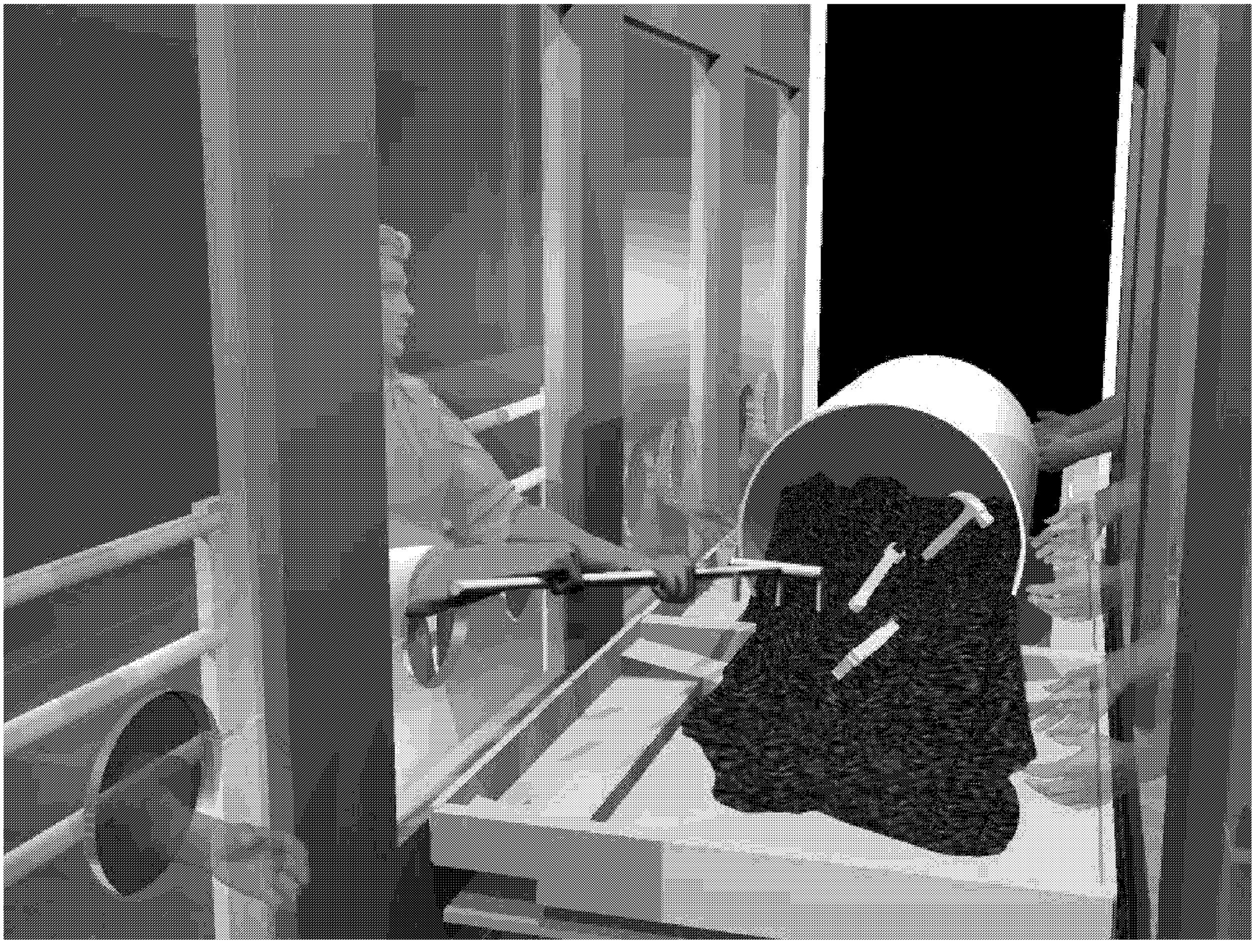

Figure 3-33. Lids are removed from intact drums and the waste is unloaded.

Waste Sorting and Inspection. The waste is sorted and inspected to locate visually unidentifiable combustible material. This material is handled as described in the waste fissile monitoring section below. Waste removed from drums is sorted on the cart at the sorting station. Bags of waste are opened and their contents inspected. The philosophy is that any waste form, except liquid, can go into any waste bagout drum with any other waste in any quantity except for visually unidentifiable combustible material.

Waste Sampling. Samples are collected from each cart-full of free waste as shown in Figure 3-34. The number and type of samples taken from each cart depend on the material in the cart. Section 3.1.3 describes the sampling procedure.

Figure 3-34. Waste is sampled by hand and packaged in bottles for analysis.

Waste Size Reduction. Waste is generally cut up only if it cannot be placed in a 55- or 85-gal drum. Waste that cannot be easily sized with hand tools will be returned to the pit. Intact and partially-deteriorated 55-gal waste drums can be placed in an 85-gal drum with no size reduction if they are not misshaped too badly. Therefore, only badly misshapen drums need be sized to fit into the 85-gal overpack drums. If it is decided to place waste drums in 55-gal drums, their size must be reduced, as shown in Figure 3-35. Size reduction is done using sawsalls, shears, or nibblers at the sorting station. In general, steel sheets up to 1/8-in. thick can be cut with the shears or nibblers; plate or bolts up to 1/2-in. thick can be cut with the sawsall. Cemented waste drums are placed in the 85-gal overpack drum without size reduction.

Waste Fissile Monitoring. Waste that is visually unidentifiable combustible material is monitored for fissile content. As shown in Figure 3-30, the waste is moved to the outermost gloveport station where it is placed in a well in the bottom of the glovebox. A fissile monitor located outside of the confinement under the glovebox detects fissile signals from waste inside the well. This waste is dispositioned according to the results of the fissile interrogation. In this manner, the amount of fissile material can be kept below the limit of 200 g per drum.

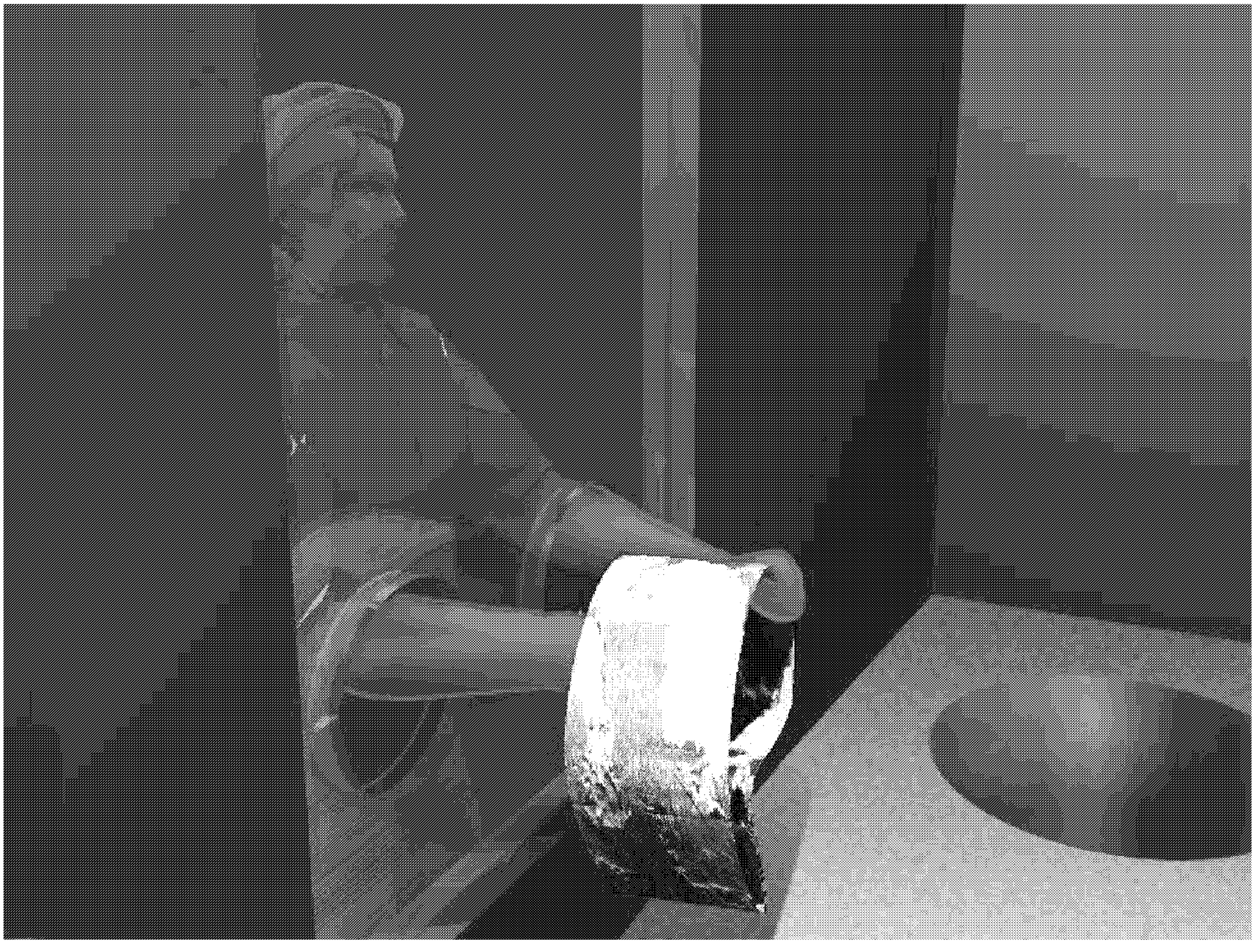

Figure 3-35. Drums and large items can be sized in the glovebox using hand tools.

Waste Packaging. Except for visually unidentifiable combustible material, waste items are not segregated. Unsegregated waste is packaged in the two 55-gal bagout drum stations at either side of the sorting station. Normally, one of the drums is in the process of being bagged out while the other drum is being loaded with waste. Visually unidentifiable combustible material with high fissile content is packaged on a case-by-case basis to ensure that the fissile gram limit is not exceeded.

Most waste is packaged in 55-gal drums. The 85-gal bagout drum is only used to package intact drums or parts of drums that do not fit in a 55-gal drum. If an empty intact drum is placed in an 85-gal drum, additional metal debris may be added to increase the packaging efficiency.

Waste Bagout. The standard double bagout method, shown in Figure 3-29, is used to seal the drums and maintain confinement and externally clean, bagged-out drums. A taped and sealed bagout stub is attached to the bottom of the bagout port when a new empty drum arrives at the station. This bagout stub forms the primary confinement under the bagout port.

A manual forklift is used to position the drum under the bagout stub. The new drum has an internal bagout bag when it arrives. The scissors lift positions the drum at the proper height so that the new bag can be sealed to the port above the old bagout stub. When this seal is made, the bagout stub is pulled into the drum and the new bag now forms the confinement. After the drum is filled, the bag is cinched, sealed, and cut above the drum to form a new stub. The bottom half of the stub is placed in the drum, the drum lid is attached, and the drum is removed from the loading station. This completes a bagout cycle.

3.6 Support Mechanical Systems

The support mechanical systems are systems required for general plant infrastructure, as opposed to those directly required for the process. These mechanical systems support the structures and operations, process, and ancillary equipment.

Support Mechanical Systems

- Heating, ventilation, and air conditioning (HVAC) systems
- Dust suppression system
- Breathing air system
- Fire protection systems
- Life safety systems.

3.6.1 Heating, Ventilation, and Air Conditioning

The HVAC design considerations include: occupant comfort and activity, hazards (chemical and radioactive), confinement zone classifications (relative pressure differentials), credible breach face velocity, air change rates, exhaust rates, and velocities. The HVAC is considered integral to industrial safety and hygiene practices, passive safe shutdown philosophy, and monitoring activities. The airflow diagram for the WES, PGS, and RCS is shown in Figure 3-36.

Weather Enclosure Structure (WES).

Confinement Zone Classification—The weather enclosure structure (WES) confinement (pressure) zone classification is: **Clean Zone**. The WES will be maintained at a negative differential pressure of at least 0.1 iwg, with respect to the outside atmosphere.

Airflow—Airflow quantities are dictated by several factors. Two of the major factors for the WES include air ventilation rate requirements and total facility exhaust air requirements. The minimum acceptable ventilation rate for F-1 occupancies is 1 cfm/ft^2. Because the entire facility is an F-1 occupancy, this ventilation rate is required as the minimum rate throughout the facility. All systems that exhaust air take their supply air from the WES. Therefore, the WES airflow requirement is the sum of all air that is exhausted from other areas of the facility.

Inlet air from the outside is subject to pressure changes based on wind velocity. To help counteract this, air inlets are placed at three locations on both the north and south sides of the facility. Air will be drawn through inlet air louvers, inlet air filters, and counterbalanced backdraft dampers.

Inlet air louver sizing will be performed during Title design to ensure compliance with allowable pressure loss and acceptable louver face velocity to prevent the airflow from carrying moisture into the WES. Air filter sizing will also be performed during Title design.

Hoar frost collects on surfaces that are colder than the atmospheric air during periods with high humidity. As the inlet air will be unheated, there is a potential for hoar frost buildup on the inlet air filter. In that event, inlet non-HEPA filters will be removed. Therefore, no inlet air preheating will be included.

Supply air to the facility will be filtered to minimize loading of exhaust filters with atmospheric dirt and dust. With the exception of infiltration air, all inlet air to the WES will be filtered with roughing filters to minimize outside dust infiltration. Because of the potential for contamination within the WES,

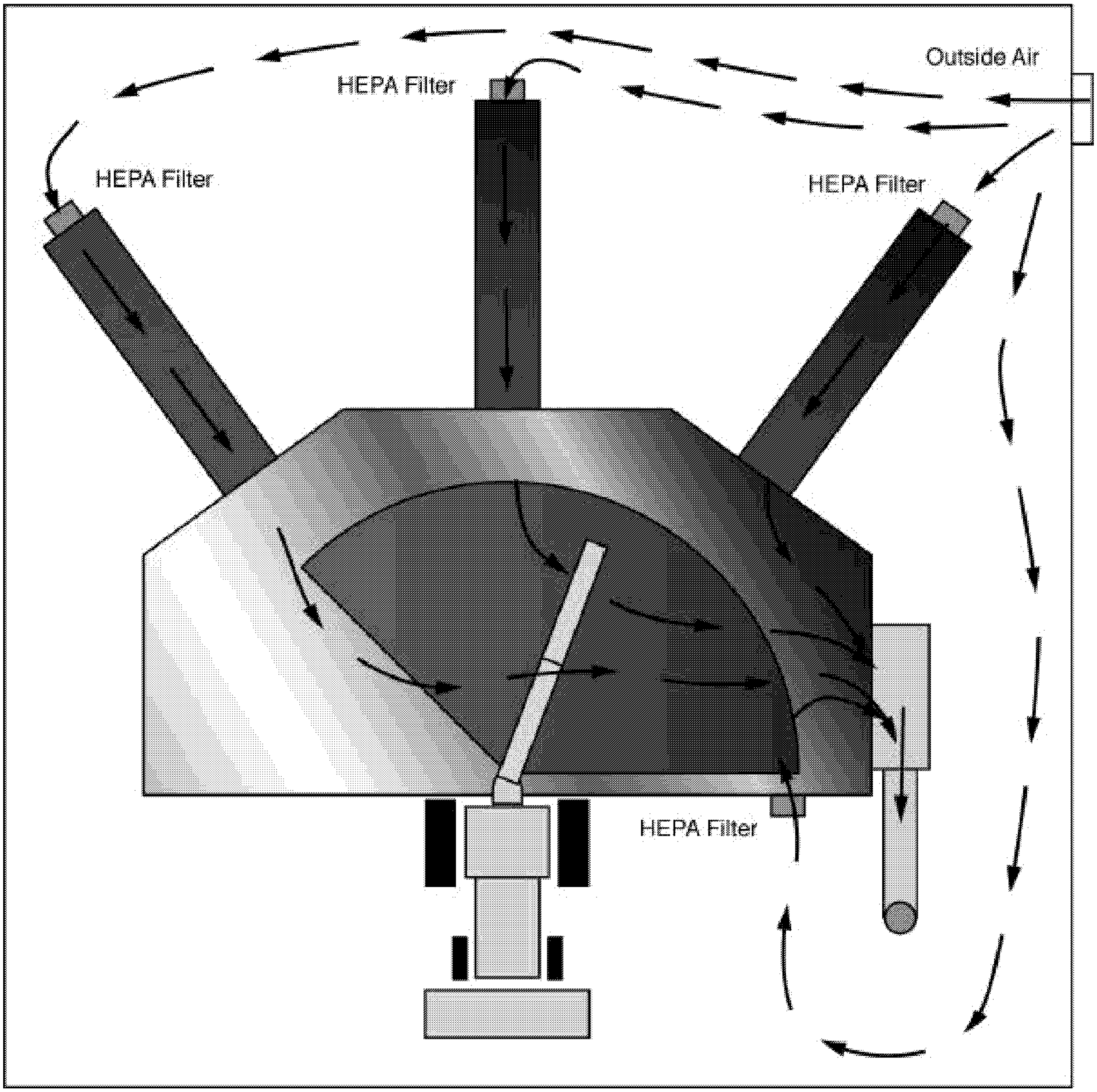

Figure 3-36. Air flow patterns within the WES and RCS.

all exhaust air will be used as supply air into more contaminated areas and will thus be HEPA filtered before exhaust to the environment.

The counterbalanced inlet air backdraft damper serves two purposes. First, the damper provides backdraft protection to reduce the possibility of air flow from the WES. Second, the damper will be balanced to provide the necessary pressure drop to maintain the required static pressure inside the WES.

Building Heating Systems Design—General area heating is not required for this facility. However, because personnel may be required to work in the facility during the winter months, the facility will be heated to personnel comfort range using radiant heaters.

The heat required for freeze protection is more than that required for comfort heating, thus, freeze protection is not provided by the heating system. Water systems or other systems requiring freeze protection will be protected by other means.

Cooling Systems Design—In general, cooling the WES is not required. Based on past experience in similar facilities at the INEEL, including warehouses and storage modules, it is expected that temperatures in the WES will be 10 to 15 degrees cooler than the outside atmosphere during summer months. However, there may be times when spot cooling will be desired in areas where operators will be concentrating their time and efforts. Spot cooling will be accomplished with small personal Man Coolers. These coolers are portable and powered from standard power outlets. Man Cooler make and model will be determined in Title design. It is anticipated that no more than 6 of these coolers will be required.

Personnel Monitoring Room.

Confinement Zone Classification—The personnel monitoring room confinement (pressure) zone classification is: **Clean Zone**. Personnel monitoring room zone pressure must be maintained at a negative differential pressure of at least 0.1 iwg with respect to the personnel access room, and at the same pressure as the WES. As with the WES, these requirements are minimums, meaning that the actual design pressures may be more negative than required.

Ventilation rates of not less than 1 cfm/ft^2 are required, and will be adhered to.

Personnel Access Room.

Confinement Zone Classification—The personnel access room confinement (pressure) zone classification is: **Zone I**. The personnel access room pressure must be maintained at a negative differential pressure of at least 0.1 iwg with respect to the personnel monitoring room, which is Zone I, and positive 0.5 iwg with respect to the RCS, which is Zone III. Again, these requirements are minimums, meaning that the actual design pressures may be more negative than required.

Airflow—Required ventilation rates for F-1 occupancy are not less than 1 cfm/ft^2. Air filtration from the personnel monitoring room to the personnel access room is not required. Air filtration (HEPA filter) is required to maintain contamination control between the personnel access room and the RCS.

Full Drum Staging.

Confinement Zone Classification—The full drum staging room confinement (pressure) zone classification is: **Zone I**. The full drum staging room pressure must be maintained at a negative differential pressure of at least 0.1 iwg with respect to the WES, which is a Clean Zone, and positive 0.5 iwg with respect to RCS, which is Zone III. These requirements are minimums, meaning that the actual design pressures may be more negative than required.

Airflow—Full drum staging room airflow ventilation rates for an F-1 occupancy must not be less than 1 cfm/ft^2. Air filtration from the WES to the full drum staging room is not required. However, air filtration (HEPA filter) will be provided, as required, between the full drum staging room and the RCS to maintain contamination control.

Retrieval Confinement Structure (RCS).

Confinement Zone Classification**—**The RCS Confinement (pressure) zone classification is: **Zone III.** RCS zone pressure must be maintained at a negative differential pressure of at least 0.5 iwg with respect to the personnel access room and full drum staging room, both of which are Zone I, and negative 0.6 iwg with respect to WES, which is a Clean Zone. These requirements are minimums, meaning that the actual design pressures may be more negative than required.

Airflow**—**Three of the major factors dictating airflow quantities include air ventilation rate requirements, air exchange rate requirements, and capture velocity requirements. The minimum acceptable ventilation rate required for F-1 occupancies is 1 cfm/ft^2. Because the entire facility is an F-1 occupancy, this ventilation rate is required as the minimum rate throughout the facility. In addition, a ventilation rate adequate to ensure airflow of 125 linear ft/min through a credible breach in the enclosure system is also required.

Where hazardous gases are expected to be present, air exchange rates of 6 to 10 air changes per hour are recommended. Exchange rates in this range are generally accepted as adequate for removal/dilution of the hazardous gases. However, because of the potential for radioactive particulate, alpha contamination, and hazardous gases, the higher limit of the air exchange rate will be used for the RCS.

The ventilation philosophy is that the system is inherently safe because only one fan system exhausts from the most contaminated areas (Zone III). There is no means to pressurize any of the more contaminated zones with respect to the less contaminated zones. With this philosophy, it is desired to exhaust all air from the WES into the RCS. Based on this criterion, the greater of the airflow requirements is that of the WES.

HEPA filtration is required in the air inlet of Zone III areas. Inlet air to the RCS from the WES, the personnel access room, and the full drum staging room will be filtered through inlet HEPA filters. Details will be provided in Title Design.

Additionally, all exhaust air from the facility will be HEPA filtered through two separate, independently testable HEPA filters at the facility main filter bank prior to discharge. To enable change-out of some filters while the system is in operation, the filter bank will consist of nine filter units, of 1,000 cfm capacity each. The filter bank will consist of a set of nine pre-filters, a DOP test section, nine moisture separators, and nine HEPA filters. A full standby exhaust fan is provided to avoid a single-point failure of the exhaust system. Further filter details will be determined in Title design.

The exhaust fan will be sized to deliver 6,860 cfm, plus a contingency factor of 20% at the given pressure requirement, for an overall capacity of 8,232 cfm to overcome the following:

RCS Inlet Filters, Dampers, Rooms	3 iwg
RCS Exhaust Ducting, Stack, & Outlet	2 iwg
Main Filter Bank	8 iwg
Total Fan Pressure (Max.)	13 iwg

Fans capable of delivering the required flow at the required pressure are available in the 20-hp range.

Environmental release calculations are based on release of all exhaust air at ground level. These calculations indicate that no stack is required. An exhaust system that will allow efficient sampling and monitoring will be provided; it will discharge outside the WES above the zone of worker occupancy.

3.6.2 Dust Suppression System

The dust suppression system is an integral factor in pollution prevention and waste minimization as they relate to decontamination and decommissioning and air filter loading. At the same time, the dust suppression system is an integral factor in providing better visual space and better contamination control as they relate to industrial safety and hygiene.

The three operations causing concern for dust generation are: during the excavator dig, transfer to the cart using the excavator, and dumping into the cart using the excavator.

Several methods or systems are available for dust suppression and control. Those considered were:

- Dry fog system
- Mist system
- Fixatives
- Local ventilation system.

The dry fog system was selected. This system combines water and compressed air, and is desirable because a 1–10 micron range is the typical fog particle size achievable. Approximately 85% of the fog particles fall within this range. In order to achieve agglomeration (attraction between the fog and the dust), the dust particle in question must be approximately the same size as the fog droplets. Airflow around a larger droplet (mist droplet size = 10–50 microns) prevents dust particles from contacting the droplet. The fog and the dust will fall out of the air together, increasing visibility for the processes. The relative size of a dust particle ranges from 1–100 microns. Very fine particles are smaller than 10 microns, are considered to be the cause of pollutants, and can possibly escape from confinement areas. A fog system can return a large proportion of these dust particles to the ground, which is advantageous to a ventilation system. The use of Pu-specific water additives to enhance system effectiveness will be evaluated during Title design. The dry fog dust suppression system is shown in Figure 3-37.

The dry fog system consumes minimal water and minimizes material wetting. It uses approximately 30 psi water pressure and 70 psi compressed air pressure. The dry fog system uses a larger nozzle orifice (.028 in.) than the mist system (.006 in.), which creates less possibility of a nozzle-clogging problem. By using a larger orifice, a treated water supply isn't necessary. In addition, the dry fog system can be purged with just the compressed air to remove all stagnant water. Fogging systems are considered the best available control technology (BACT) in many regions, and they are well liked by both users and regulatory agencies.

Freeze protection will be considered in title design.

Fixatives (chemical, natural) are not useful for digging or dumping operations, and may introduce new chemicals requiring procurement into the process and into storage.

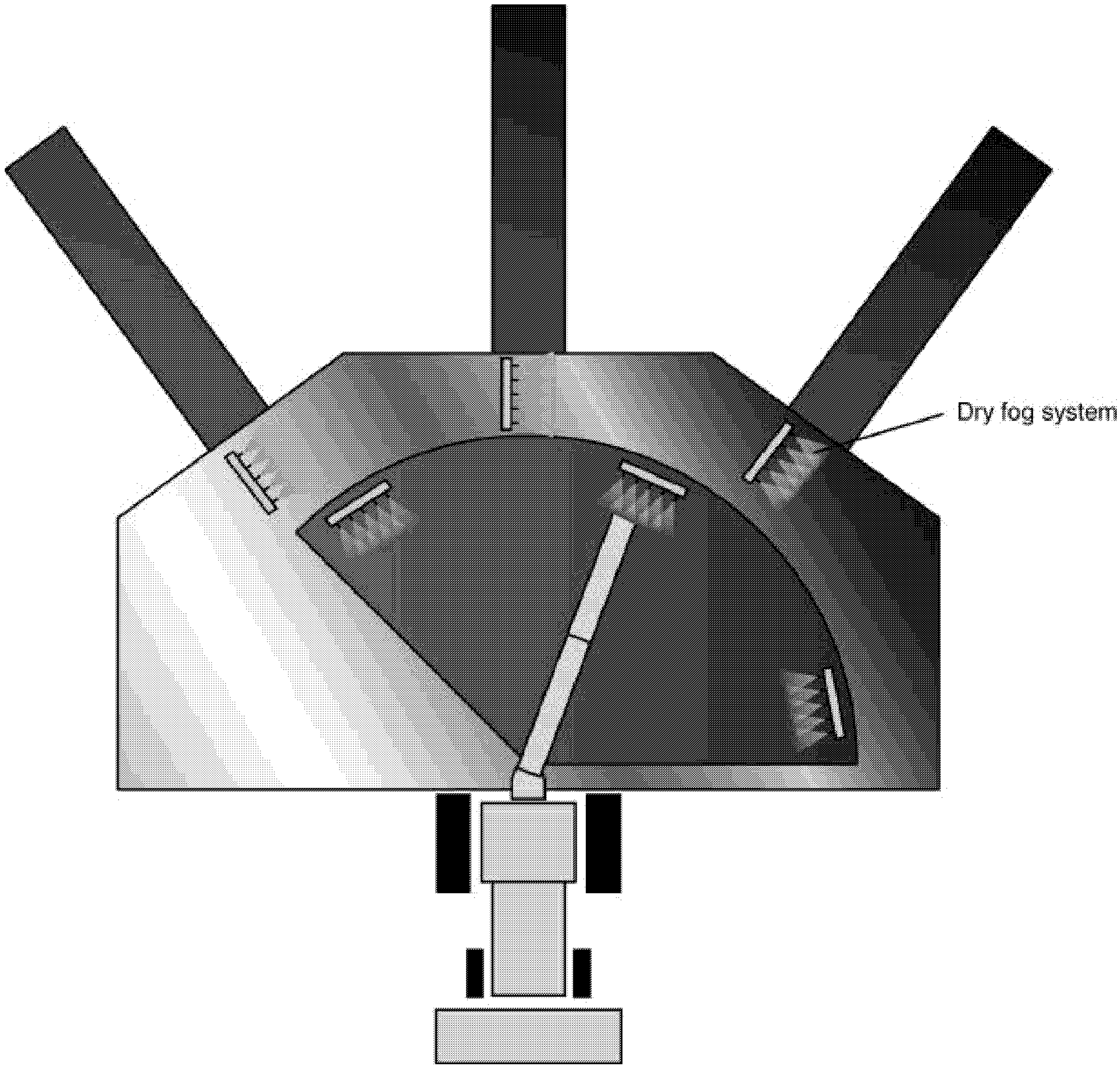

Figure 3-37. Dust suppression dry-fog system nozzle locations.

Localized ventilation at an excavation site is not efficient. The capture velocity for the dust particles, relative to the distance between the ventilation inlet and the source, makes it difficult to avoid congestion for the excavator and operator. The transport velocity to prevent settling out within the ductwork and creating “hot” spots must be high, which increases fan sizing and horsepower. Also, filter loading increases, which, in turn, increases filter change-out cycles and waste.

The dust suppression system is located around the dig site and cart areas shown on the drawings (see Appendix C). The nozzles are sectioned so the desired bank of nozzles can be manually activated. The nozzle locations and operating sequence takes into consideration lighting, windows, cameras, and operations.

In relation to the dust suppression system, a need for compressed air has been identified. Compressed air will be provided via a portable, self-contained trailer, positioned as shown on the drawings (see Appendix C). Options considered for the compressed air supply included: a portable, self-contained trailer-mount system and an indoor skid-mount system.

The portable, self-contained trailer-mount system was selected due to inlet air requirements (and its lesser complication on the HVAC system, noise generation, heat generation, and the possibility of obtaining an existing on-site system).

Window and lens fogging will be considered during title design (i.e., nitrogen purge, air purge).

3.6.3 Breathing Air System

Breathing air (BA) may be needed for entries. Therefore, the design shall provide breathing air for entries into contaminated areas. Actual appropriate respiratory protection (i.e. hoods, full face masks, bubble suits, etc.) will be based upon potential contaminants and respiratory protection factors. The BA system capacity is sized for 4 people in bubble suits, with 5 minutes of reserve capacity. Sizing the BA system based on bubble suits is conservative since hoods and full face mask require less air. Features designed into the building structures (i.e. bulkhead fittings, notches in doors for airline routing) will be addressed in Title design.

A portable, self-contained trailer with a compressor system will supply the breathing air. The trailer will be located as shown on the drawings (see Appendix C). Trailer power will be routed and tied into a 460-Vac power source. No other utilities or tie-ins are required. At present, there are five breathing air trailers located throughout the various INEEL Site areas. Arrangements for obtaining a trailer will be made ahead of time to ensure trailer availability.

3.6.4 Fire Protection System Design

The glovebox excavator project facility fire protection will consist of the following components and subsystems:

- Water supply
- WES automatic sprinkler system
- RCS automatic sprinkler system
- RCS manual deluge system
- PGS water-mist automatic extinguishing system
- Glovebox excavator project facility fire detection and alarm system.

Glovebox Excavator Project Facility Water Supply. The RWMC will provide adequate fire water to supply the facility fire suppression systems and provide a way for the INEEL Fire Department to conduct manual suppression fire-ground operations. The minimum acceptable supply is 2,000 gpm @ 20 psi.

Connections to the RWMC fire water system will be sized to provide required flows and pressures for the most demanding automatic suppression system. The sprinkler riser enclosure for the glovebox excavator project facility will be located so that it does not require extension of underground fire water piping into the SDA.

A minimum of one fire hydrant, accessible by fire department apparatus, will be located within 300 ft of the facility. Supply piping to the hydrant will be sized to provide a minimum of 2,000 gpm at 20 psi fire flow. Because of the temporary nature of the facility, and the soil disturbance restrictions within the SDA, an above ground water supply piping will be provided for the fire hydrant. The design will incorporate sound engineering practice, with compliance to the relevant codes and standards. The hydrant water supply piping will provide a hard connection to the RWMC fire water distribution system. The piping and hydrant shall be maintained normally dry and provide for drainage to prevent freeze damage.

WES Automatic Sprinkler System. A dry-pipe automatic sprinkler system will be provided throughout all areas of the WES. The system will provide protection for an Ordinary Hazard, Group 2 occupancy. The system will be based upon a minimum density of 0.2 gpm/ft^2 over the most hydraulically remote 1,950 ft^2, whichever is smaller (Standard Response, Ordinary temperature rated). 500 gpm hydrant allowance will be added at the point of connection to the main fire water distribution system. The available water supply for design purposes will be considered 150 psi static, 145 psi residual, flowing 950 gpm, based on July 1998 testing data.

A dedicated air supply will be provided to maintain required air pressure on the system and to refill the system piping within 30 minutes.

The sprinkler system piping will be routed from the sprinkler riser enclosure, located in the RWMC Operations Area, to the WES, using a pipe rack support system, in a manner that prevents physical damage. Piping will be sloped to drain; all low points will incorporate auxiliary drains and be equipped with drain valves.

RCS Automatic Sprinkler System. A dry-pipe automatic sprinkler system will be provided throughout all areas of the RCS, including associated air locks.

The system will provide protection for an Ordinary Hazard, Group 2 occupancy. The system will be based upon a minimum density of 0.2 gpm/ft^2 over the most hydraulically remote 1,950 ft^2, or the area of the RCS, whichever is smaller. 500 gpm outside hydrant allowance will be added at the point of connection to the main fire water distribution system. The available water supply for design purposes will be considered 150 psi static, 145 psi residual, flowing 950 gpm, based on July 1998 testing data. Sprinklers for the system are to be upright, high-temperature.

An air supply will be provided to maintain required air pressure on the system and to refill the piping within 30 minutes.

The sprinkler system piping will be routed from the sprinkler riser enclosure, located in the RWMC Operations Area, to the RCS using a pipe rack. Piping will be sloped to drain, and low points will be minimized to the extent practical. Low points, or similar water traps, within the piping will be provided with readily accessible auxiliary drains. The low-point drains will not discharge within the RCS nor will personnel access within the RCS be required to drain the system.

RCS Manual Deluge System. A manual monitor nozzle deluge system will provide suppression capabilities in the unlikely event of high-challenge, smoldering fires that would involve waste within the excavation area.

The monitor nozzle system will be manually activated, designed for 250 gpm per nozzle Extra Hazard, Group I occupancy classification. The manual monitor nozzle system will be engineered and installed to provide a reliable means for the fire department to remotely direct a large volume of water directly into the excavation in the event large smoldering fires are encountered. The system will use a minimum of 500 gpm over the entire excavation area (plan view). A 500 gpm outside hydrant stream allowance will be added at the point of connection to the main fire water distribution system. The available water supply for design purposes will be considered 150 psi static, 145 psi residual, flowing 950 gpm, based on July 1998 testing data.

The supply piping for the system will be routed from the sprinkler riser enclosure, located in the RWMC Operations Area, to the RCS using a pipe rack to prevent physical damage. Piping will be sloped to the riser, and low points will be minimized. Low points, within the system, will be provided with readily accessible auxiliary drains. The auxiliary drains will not discharge within the RCS. The system shall be designed for manual activation only.

PGS Automatic Extinguishing System. The PGS fire extinguishing system has been designated as safety significant by the Preliminary Documented Safety Analysis (PDSA). Each glovebox within the PGS will be provided with a water-mist fire extinguishing system designed to respond to and control design basis fires within the glovebox(es), prior to loss of confinement. Loss of confinement will be considered breach of structural walls or ceilings, or the loss of sufficient gloves or window seals to reduce face velocities across breach openings below required confinement thresholds. To achieve this objective, the system must minimize direct flame impingement on the gloves, seals, and enclosure.

The water-mist extinguishing systems will provide fire suppression for each of the gloveboxes, using three zones (each zone encompasses one of the three gloveboxes that comprise the PGS). The system will have a self-contained water supply and a complete backup reserve water supply. System activation will be provided by flame detectors that are cross-circuited to require two detectors to operate before the system discharges water.

The PGS fire extinguishing system will provide for detection, response, suppression and control of flames associated with Class A (normal combustibles) and B (flammable liquids) fires to minimize direct flame impingement on the confinement structure, gloves, and seals. Specifically, the system will be capable of suppressing a fire of the following characteristics that starts within any single glovebox:

1. Fire involving up to 4 gal of combustible liquid (oil/solvent), with a peak heat release rate of: 226 kW/m^2 and a maximum fire size of 300 kW

2. Fire involving up to one 55-gal drum equivalent of Class A combustible waste (assume 2.7 kg rubber, 13.4 kg plastic, 6.6 kg paper, and 3.2 kg cotton), with a peak heat release rate of 400 kW/m^2 and a maximum fire size of 300 kW.

The system will be capable of automatic activation, as well as manual activation from the PGS working platform. The system includes flame detection that meets the following performance criteria:

1. Compatible with water-mist releasing system

2. Capable of detecting spectral footprint of design basis fire (Class A or B, plastics, paper, cotton, rubber, oils, and solvents)

3. Area of coverage defined as the floor level up to 6 inches above maximum elevation of handled combustibles, including all possible waste transfer tray locations and the top of bagout drum port(s)

4. The water-mist system will activate within 5 seconds of detection of flames 6 inches in height at 3 ft away from the detector.

5. The flame detector system will not respond to ambient, non-fire UV and IR generators within the PGS.

6. The detectors are capable of being tested without personnel entry into the PGS.

7. The detectors will monitor and annunciate trouble for reduced sensitivity due to lens obscuration.

The extinguishing system and associated detection and releasing equipment will be approved for use within the environmental conditions presented by the PGS.

NOTE: Design and/or administrative controls will ensure that combustible waste materials are not staged within 3 inches of the confinement walls to ensure smoldering fires and associated glowing embers do not contact the confinement walls.

3.6.5 Life Safety Systems

The glovebox excavator project facility will be provided with a fire alarm system. The system will transmit annunciation of fire alarm, supervisory, and trouble conditions to the INEEL Proprietary Fire Alarm Monitoring System using the Digital Alarm Communication Transmitter/Digital Alarm Communication Receiver monitoring equipment.

The system will include the control panel, backup power supply, manual fire alarm stations, occupant notification audible and visual signals, and monitoring for the installed fire protection systems (wet and dry sprinkler systems; water-mist fire extinguishing system). The system will report alarm, trouble, and supervisory alarm conditions to the INEEL Fire Alarm Center. The fire alarm control panel will be located in the WES, near the water-mist fire protection system.

Adequate personnel emergency exits are provided, including exit doors provided with emergency exit hardware and exit signs. Emergency lights are installed. Local emergency notification is made by the fire alarm system audible/visual occupant notification appliances. Manual fire alarm stations are provided at the exits.

Site evacuation and take-cover signals will be provided and connected to the RWMC evacuation system.